

REMARKS

Rejection under 35 USC§ 112

The Examiner has rejected Claim 1 under 35 USC 112 second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard to be their invention, in particular with regard to the term “ambient” in step (b) thereof. Although Applicants submit that it is well known to the skilled man that ‘ambient’ temperature means ‘room temperature’ and therefore indicates an absence of heating, the definition from page 5, line 11 has been inserted into Claim 1 to overcome this objection.

Rejection under 35 USC§ 103

Claims 1-22 are rejected under 35 USC 103 as unpatentable over Poncelet (US 6,468,492), designated hereafter Poncelot ‘492, in light of Pinnavia (US 10/272,751). Since US 10/272,751 has issued as US 7,132,165 this will, however, be designated hereafter as Pinnavia ‘165.

Poncelet ‘492 teaches a method of preparing an aluminosilicate polymer of the imogolite type having a filamentous tubular crystallized structure. In order to prepare such a specific structure it is required that the method includes a solubilization, ripening and thermal treatment step.

Thus the first step is, (as in the present invention), a step of contacting a mixed aluminium-silicon alkoxide substituent or a precursor thereof with an aqueous alkali, keeping certain concentrations within set limits. As shown in the Example, this will normally be followed by a solubilization step, for example with an acid such as acetic acid, to decrease the pH and solubilize the precipitate. Then a ripening step at room temperature is required which according to col. 2 line 47 takes at least 5 days and enables the time for the subsequent thermal step to be considerably reduced. The mixture then has to be *heated* at a temperature ‘below 100°C’ and according to col. 2 lines 63-64 at 96-98°C for 24 hours, which results in the ‘formation in solution of an aluminosilicate polymer of the imogolite type’ (see col. 3 lines 1 and 2). Finally as with the present invention residual ions from the polymer are removed.

However the Examiner has already appreciated that the process of the present invention differs from that of Poncelet ‘492 in that, unlike in the latter,

it is specifically required that the silicon has both hydrolyzable substituents *and a non-hydrolyzable substituent* and, with respect to claims 18-22, that the addition of chelating agent occurs *after* the purification of the product. Moreover a *further* clear point of distinction has been introduced into Claim 1 as amended in that it now includes the subject matter of Claim 9 as an optional step, including the *further* dispersion with acid associated therewith, with support from page 7, line 3, and that the step of eliminating the byproducts follows *directly* thereafter, such that there can be no intermediate heating step, as required by Poncelet '492. Nowhere in Poncelet '492 is there any hint, teaching or suggestion that would lead the skilled man to expect that he should omit the heating step and that the whole reaction could be conducted at ambient temperature.

It should further be pointed out that the material described in Poncelet '492 is a crystallized aluminosilicate, designated imogolite (col. 1, line 14). This material has an anisotropic, tubular, filamentous structure, made of a bent gibbsite-like sheet (aluminum hydroxide material) forming the exterior part of the filamentous particle and a silica monolayer, covalently linked to the gibbsite-like sheet, forming the interior part of the filamentous particle.

The material described in the present invention also exhibits an anisotropic structure with, however, a mixture of the silanol and organic moiety on the interior part of the structure, but has a non-filamentous, spherical morphology and is amorphous in character, as shown by electron diffraction (see page 3, line 14).

Indeed the specification discloses that the material obtainable by the method in accordance with the method of Poncelet '492 is quite different from that of the present invention, as can be seen by a comparison of the Raman spectra. Thus Comparative Example 1 is as described in EP-A-1 112 959 which is the equivalent of Poncelet '492. It is said at the end of this Example that materials that have the same Raman signature belong to the same family.

The Raman spectrum of this material is represented by Fig. 1 and it is stated on page 9, lines 20-21 that an imogolite fibrous aluminosilicate polymer was obtained. The relevant footprint for comparison is at the low wavenumber, the peak at the higher wave number end corresponding with the presence of the carboxylate ion from the addition of the acetic acid in step (a). It will be seen that there is a main peak at about 500 cm^{-1} with a peak close on either side.

In order to make as close a comparison as possible with a product obtained in accordance with the invention, this should be compared with Fig. 9 as this pertains to Example 10 which included the addition of acetic acid, albeit as a chelating agent in step e). Again there are peaks corresponding to the acid at the high wavenumber but it will be clearly seen that the Raman spectrum is quite different as befitting a very different structural material. Here the main peak is at 1000 cm^{-1} but there is no discernible peak at 500 cm^{-1} , confirming the very different nature of the spherical, amorphous aluminosilicate. Thus the materials produced according to the process of Poncelet '492 on the one hand and the present invention on the other hand are quite different, that of Poncelet '492 being in a fibrous, tubular form and that of the present invention being in a spherical, amorphous form.

The Examiner however has stated that, although Poncelet '492 does not use a silicon compound having a non-hydrolyzable precursor, he considers that use of such a compound is taught however in Pinnavia '165 and that there is significant motivation to combine the disclosure of Poncelet '492 with that of Pinnavia '165.

The anisotropic structure according to the process of Poncelet '492 and the present invention is obtained thanks to the sp^3 character of the silicon atom and to the covalent interactions of the silicon atom with the aluminum atom through three oxo-bridges. The key parameter which allows this kind of anisotropic structures to be synthesized is the control of the curvature of the proto-gibbsite sheet by matching the reactivity of both gibbsite and silica precursors: if the synthesis does not allow the control of this crucial step, the final product will be a mixture of gibbsite and silica or organosilica instead of the required aluminosilicate structure.

Pinnavia '165 teaches the use of silane coupling agents having hydrolyzable groups and one, two or three non-hydrolyzable groups (see col.11, lines 46-52) without distinguishing between these options. However the reactivity of silica precursors such as silane coupling agent $R_xSi(OR')_y$ ($x=0-4$ and $y=4-0$, with $x+y=4$) is strongly affected by the nature and the number of R and R' groups and many of these coupling agents could not be used in the present invention, due to the reactivity mismatch between the gibbsite precursor and the silica precursor.

Thus it has been found that only silane coupling agents bearing *one non-hydrolyzable group* (R) with the other groups being hydrolyzable groups (R') can be used in the present invention. Other silane coupling agents with more non-hydrolyzable groups e.g. $(R_xSi_x(OR')_y)$, ($x=2$ or 3 , $y=2$ or 1 and $x+y=4$) would not lead to the silica composition having the structure described in the present invention, because there would not be the three necessary oxo-bridges involved in the mechanism to form the anisotropic structure, coming from the three hydrolyzable groups. Claim 1 has accordingly been clarified such that it is unequivocal that there is only one non-hydrolyzable group present.

There was no suggestion from Pinnavia '165 that selection of a coupling agent with only one non-hydrolyzable group would lead to the synthesis of the structure described in the present invention. Nor is there any suggestion that a silane coupling agent without a non-hydrolyzable group, as in the invention of Poncelet '492, could be used. There was thus no motivation to combine the disclosures thereof.

In fact it will be appreciated that the invention of Pinnavia '165 relates to a method of preparing a *lamellar*, mesoporous quasi-crystalline silica composition by the use of a gemini amine surfactant acting as a *template or structure directing agent* when reacting an orthosilicate. The surfactant can later be removed, leaving the structural framework, and the resulting composition can react with functional groups to extend the utility of the compositions, for example as metal ion traps for the removal of toxic metals from contaminated water.

The use of a surfactant is thus an essential part of the invention for forming the structure of the composition of Pinnavia '165. In contrast there is no surfactant used or necessary in preparing either the composition of the present invention or that of Poncelet '492 and thus there is again no motivation for the skilled man to consider combining the disclosures of Poncelet '492 and Pinnavia '165. The skilled person would know that in Pinnavia '165 the non-hydrolyzable constituent borne by the silane coupling agent would interact with the surfactant and help to grow the expected aluminosilicate structure. In the present invention however there is no expectation that the non-hydrolyzable group of the silane coupling agent would help to grow the anisotropic structure.

The Examiner states that the present invention is distinguished from Poncelet '492 in that it teaches the introduction of a 'chelating agent' after

the purification of the product. According to Poncelet '492, a 50:50 mixture by volume of HCl and CH₃CO₂H as chelating agent is used immediately after step (a), its purpose being only to redisperse i.e. solubilize the precipitate by lowering the pH which is necessary before the ripening step.

In contrast, the chelating agent, if used, is for quite a different purpose in the present invention, being an optional *final* step, i.e after eliminating the byproducts. The purpose of the chelating agent here is to allow the modification of the surface of the aluminosilicate polymer by forming a chelate *compound*, the functional group of the chelating agent allowing an increase in affinity of the aluminosilicate polymer with the medium in which it is used (as explained on page 8, lines 18-21). The chelating agents are used at entirely different steps in the overall process for different purposes and as shown above result in the preparation of materially different products.

The Examiner refers to Pinnavia '165 as teaching that surfaces may be functionalized by reaction with various chlorides, fluorides, silylating or alkylating agents. In contrast it will be seen that the chelating agents used in the present invention are acids such as carboxylic acids, phosphonic acids, esters, amino acids etc. There is no hint, teaching or suggestion in Pinnavia '165 that such a 'chelating agent' were to be used, nor that it could be used in association with the multistep process of the present invention.

It is respectfully submitted therefore that the invention as presently disclosed in claim 1 is patentably distinct from the disclosures of Poncelet '492 and Pinnavia '165 in combination.

Double patenting

Claims 1-22 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting (ODP) over claims 1-17 of copending application no. 10/521348 in view of Pinnavia '165. The Examiner states that the conflicting claims are considered to be identical to the instant claims except for the addition of non-hydrolyzable functional groups of silicon compounds as taught by Pinnavia, and that it would have been obvious to one of ordinary skill in the art to make such a modification as set forth in the 103 rejection. This rejection is respectfully traversed, as the claims of the instant application and those of copending application no. 10/521348 are directed

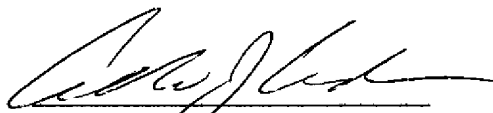
towards mutually exclusive inventions. In particular, the invention of present claim 1 requires “treating a mixed aluminum and silicon alkoxide of which the silicon has hydrolyzable substituents and one non-hydrolyzable substituent, or a mixed aluminum and silicon precursor resulting from the hydrolysis of a mixture of aluminum compounds and silicon compounds only having hydrolyzable substituents and silicon compounds having one non-hydrolyzable substituent” (underlining added). In contrast claim 1 of the invention of copending application no. 10/521348 requires “treating a mixed aluminum and silicon alkoxide only comprising hydrolyzable functions, or a mixed aluminum and silicon precursor resulting from the hydrolysis of a mixture of aluminum compounds and silicon compounds only comprising hydrolyzable functions” (underlining added). As such claimed inventions are directed towards mutually exclusive inventions, neither claimed invention anticipates the other. Further, the Examiner has not in any way established a prima facie case of obvious of the present claims over those of copending application no. 10/521348 in view of Pinnavia, as no reasonable explanation has been set forth as to why it would be obvious to modify the invention of copending application no. 10/521348 in view of Pinnavia in a way that would necessarily result in the present claimed invention. Reconsideration of this rejection is accordingly respectfully requested.

Claims 23-24 are provisionally rejected under 35 USC 101 as claiming the same invention as that of claim 1 of copending application no. 10/521898. This rejection is respectfully traversed, as rather than claim the same invention, the claims 23-24 of the present application are directed towards a material obtainable by the method of claim claim 1 (i.e., a hybrid aluminosilicate polymer), while claim 1 of 10/521898 is directed towards an ink jet recording element comprising a support and at least one ink-receiving layer, wherein said ink-receiving layer comprises at least one hydrosoluble binder and at least one hybrid aluminosilicate polymer obtainable by the specified preparation method. While the hybrid aluminosilicate polymer employed in the ink jet recording element of 10/521898 may be the same polymer claimed in the present invention, the claimed inventions (i.e., polymer material itself and ink jet recording element comprising such a polymer) are clearly distinct claimed inventions.

Rather than be the same invention as alleged by the Examiner, such inventions may be regarded as sub-combination and combination inventions. The instant application and copending application no. 10/521898 were filed on the same day. In accordance with MPEP 804 I.B.1, it is respectfully urged that to the extent any provisional nonstatutory double patenting rejection may be alleged instead of the clearly inappropriate statutory 35 USC 101 rejection, and such ODP type rejection becomes the only rejection remaining in this application, and the copending application has not been allowed, the invention of the instant application may be regarded as the "base" invention, and any such provisional rejection should be withdrawn in this application and this application allowed to issue. A terminal disclaimer may be filed, if required, in the copending application prior to issuance thereof.

In view of the foregoing amendments and remarks, reconsideration of this patent application is respectfully requested. A prompt and favorable action by the Examiner is earnestly solicited. Should the Examiner believe any remaining issues may be resolved via a telephone interview, the Examiner is encouraged to contact Applicants' representative at the number below to discuss such issues.

Respectfully submitted,



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If the Examiner is unable to reach the Applicant(s) Attorney at the telephone number provided, the Examiner is requested to communicate with Eastman Kodak Company Patent Operations at (585) 477-4656.